THE OPEN UNIVERSITY OF SRI LANKA
B.SC. DEGREE PROGRAMME: LEVEL 05
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
FINAL EXAMINATION 2011/2012
CPU3245 – COMPUTER NETWORKS AND SECURITY
DURATION: Three Hours (3 hours)

| Date: 02/07/2012 | Time: 1.30 pm – 4.30 pm |
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Answer **FOUR** Questions **Only**

## QUESTION 1

1.1)   Describe the difference between *connection oriented service* and *connection less service* with an example for each type of service.

1.2)   Explain how *multiplexing* and *segmentation* works in computer networks with suitable diagrams.

1.3)   A router and a server are directly connected using a UTP network cable. Specify the color codes of the wires in both sides of the cable.

1.4)   Compare the *Thick Ethernet* and the *Thin Ethernet* cabling standards.

1.5)   An industry standard Ultrium tape can hold about 200 Gigabytes. A group of tapes could be sent from Colombo to Kandy in 4 hours. There are 40 tape machines in Colombo which could be used in parallel. Each machine can read data from the tape with a speed of 800Mbps and write data to the tape with the speed of 400Mbps. There are 20 such tape machines in Kandy with the same capacity.

a) Considering the read/write times and tape transport times, <u>calculate the bandwidth</u> (in Gbps) of the backup and restore operation of 5000 Gigabytes of data backed up from Colombo and restored in Kandy.

b) Suppose 5Gbps optical fiber data link is also utilized in parallel, calculate the number of seconds that could be saved from the above transaction.
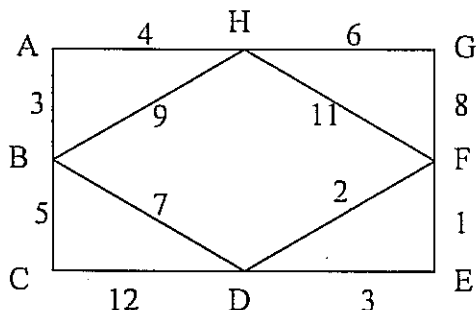
## QUESTION 2

2.1)   What is a *Frame* in the context of data link layer ?  Give four (4) methods of determining the start and the end of a frame.

2.2 )   Explain the operation of the *Simplex Stop and Wait Protocol*. Write a simple algorithm for simulating the operation of the protocol.

2.3)   Draw headers of IP and TCP segment separately. Briefly explain the different sections of each header.

2.4)   Draw a sequence diagram and explain 3 way handshake operation of the TCP connection establishment between two hosts.

## QUESTION 3

3.1)   Explain the *Count to Infinity Problem* occur in Distance Vector Routing using an example.

3.2)   List the three (3) reserved ranges for Private IP addresses.

3.3)   Why *NAT* is required in a computer network ? Explain an operation of a NAT box (server) using a proper example.

3.4)   ABC company has several branches and PCs (number given within brackets) located in Colombo (135), Kandy(100), Mathara(36) and Baticalloa(15) respectively. Company is having plans of opening a branch in Anuradhapura as well. The company is having an IP block of 123.110.100.0/22.   Answer the following;

      a) What is the maximum number of hosts that could be accommodated for the company without breaking down into sub networks.

      b) Subnet the given IP block to all the existing and proposed branches. Provide the network address, subnet mask, starting host address and the broadcast address of each subnet allocated to a particular branch.

      c) Suppose the Kandy branch has to be further subnetted into 3 departments HR, Academic and administration. Based on the answer of the 3.4.b give the network address, starting host address and ending host address of each department in the Kandy branch.

## QUESTION 4

4.1)   Why *Routers* are used in a computer network ?

4.2)   List all the link state packets generated at a given point of time for the following topology. A-H are router node labels and the numbers are propagation delays.



4.3)   Use the following topology and information provided to answer the rest of the question. Give appropriate commands to be entered in the console for each of the routers. Always assume that you are at the USER mode login prompt.

a) Decide and write the IP address of each interface of the routers, PCs and Servers based on the information given in the topology below.
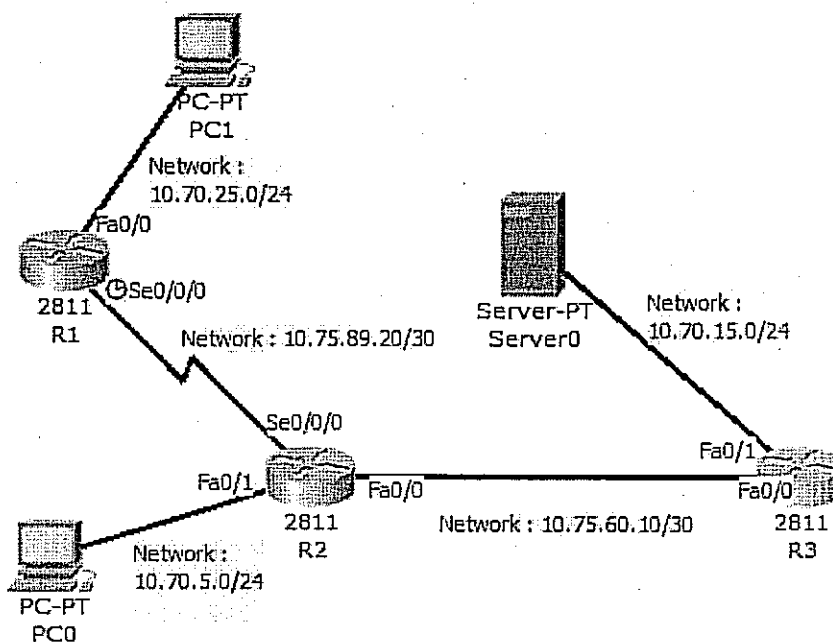
a) Configure R1 console password to *myconsole*, EXEC mode password to *itispriviledged* and login banner to *"hi this is admin router"*. Assign proper hostnames to the routers as indicated in the topology.

b) Assign the appropriate IP addresses and masks to the interfaces of the routers and turn on the links.

c) Give the command to list all the IP addresses that you assign for router interfaces in a specific router.

d) Configure the static routing in all the routers with commands to save the configuration.

e) Assuming 16 telnet consoles are supported in R3, set the telnet password of R3 to *insecurepassword*.

## QUESTION 5

5.1)    What is *DMZ* ?

5.2)    Explain the purpose of having *DMZ honeynet*.

5.3)    List three (3) generations of firewalls and explain the functionality of each firewall.

5.4)    Explain the operation of the following IP tables command.

```
iptables -A INPUT -s 0/0 -i eth0 -d 192.168.1.1  -p TCP -j ACCEPT
```

5.5)  Use the following topology to construct proper firewall configuration rules. default policy is set to deny all traffic in all the interfaces of the firewall.
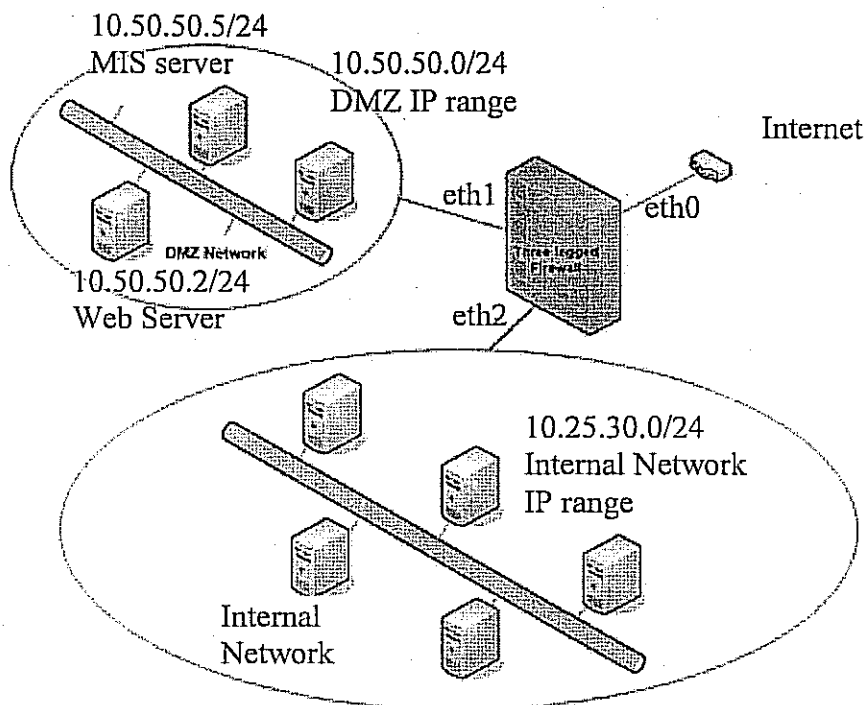


a) Allow the access to MIS server web interface on ports 80 and 443 from the internal network.

b) Prohibit all access from any IP from the Internet to the MIS server.

c) Allow ping operation only from any host of internal network to any host of DMZ network.

d) Allow Webserver to be accessed from internal network as well as from the Internet.

## QUESTION 6

6.1)  What is a *Cipher text* ?

6.2)  Give the <u>main difference</u> between symmetric key algorithm and public/private key algorithms.

6.3)  How the public/private key algorithm could be used to verify a message sender is the person who actually sent the message ?

6.4)  Explain the two fundamental cryptographic principles *redundancy* and *freshness*.

6.5)  Convert the following text to a *transposition cipher*. Use the key "distance"

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